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LISTS OF SPECIES

Coastal Dune Flora, Nallavadu Village, Puducherry, India

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ABSTRACT: Coastal sand dunes (CSD) are sensitive and fragile ecosystems with variety of specific floral species. Though there are few confined studies on coastal sand dunes in temperate regions, the coastal dunes of tropics, especially the Indian coramandal coast has received scanty attention. Hence, a detailed vegetation survey of 10 belt transects (5 × 100m) along coastal dune in December 2008 was done. A total of 41 species belonging to 35 genera and 20 families were identified at different distances from the shoreline towards inland where various edaphic factors decline facilitating more floral colonization. Thus, the coastal dune systems are rich and diverse in their floral composition, even over a small area. CSD constitute a variety of habitats and gather vital ecological and economic importance. Such unique sensitive systems have to be protected from habitat degradation in order to protect their native diversity and ecological functioning.

INTRODUCTION

Coastal sand dunes (CSD) are natural structures which protect the coastal environment by absorbing energy from wind, tide and wave action. Despite geographical differences, sand dunes have been considered as a specific ecosystem due to several common environmental features. CSD constitute a variety of microenvironments due to substrate mobility and physical processes. Plants establishing on coastal sand dunes are subjected to several environmental fluctuations which affect their growth, survival and community structure. CSDs are dynamic but fragile buffer zones of sand and vegetation where the following three characteristics can be found: large quantities of sand; persistent wind capable of moving the sand; suitable locations for sand to accumulate.

Sand dunes occur throughout the world, from coastal and lakeshore plains to arid desert regions. In addition to the remarkable structure and patterns of sand dunes, they also provide habitats for a variety of life which is marvelously adapted to this unique environment.

CSD formations ultimately depend on embayment size and prevailing wind energy (Kumar *et al.*1993). Their heights differ in response to adequate sand supply, climate and local topographic features (Barbour *et al.* 1985). Plants on coastal dunes are specially adapted to withstand various environmental stresses which allow them to grow, establish and to trap sand in such harsh conditions of coastal zones, so they are mostly represented by herbs, shrubs, creepers or runners (Sridhar *et al.* 2007).

The role of vegetation in dune formation is critical and is that of a wind trap, sand binder and dune stabilizer (Wagner 1964; Dahm *et al.* 2005). The foliage of dune plants breaks wind activity leading to less erosive activity on the lee side (Chapman 1976). Pioneer zone, intermediate zone and back zone / forest zone were recognized earlier in coastal dunes and later several workers found shore, fore dune, main dune with wind ward and lee ward slopes, wet dune slacks and back dunes with plateaus, holes that supporting grasslands scrub forests, thus portraying complex ecosystem diversity (Wood house 1978; Hesp 2004). Temperate coastal dunes are well studied and documented (Koske and Gemma 1997; Sridhar and Bhagya 2007) as compared to studies on tropical coastal dunes (Kulkarni *et al.* 1997; Sridhar and Bhagya 2007).

The Ecological roles and functions of coastal dunes include: essential store of sediments, protecting the land behind them from storm erosion and potential sea level rise; filter for rainwater and groundwater and in some situations, provided aquatic habitats such as dune lakes; protection of islands from storm surges, hurricanes and erosion; trapping of the windblown sand and prevention of sand being blown further inland by the vegetation; habitats for specially adapted plants, birds, and animals - several of which are now rare or endangered; a range of unique landforms and processes which have intrinsic value and are of scientific interest; and nesting sites for sea turtles and birds.

This paper aims to generate a baseline data on coastal sand dune vegetation in the coramendal coast, with special reference to Puducherry coastline. Apparently, very few publications are available on the floral diversity of Indian sand dunes (Sridhar and Bhagya 2007).

MATERIALS AND METHODS

Study site

Puducherry is located on the Coramandal coast between 11°52'56" and 11°59'53" N, 79°45'00" and 79°52'43" E. It is limited on the East by the Bay of Bengal and on the other three sides by the Cuddalore and Villupuram district of Tamil Nadu State. Nallavadu is a coastal village with sand dune coverage of about 6 km^2 extent, present at a distance of about 14 km towards south on the way to Cuddalore from the Puducherry main town (Figure 1).

The coastal border has a length of 22 km and a breadth ranging from four to six hundred meters. Superficially, the coast is flat and sandy. The coastal zone of Puducherry

comprises newer and older dunes including saline areas of clayey texture. The study area experiences mean annual temperature of 30.0 °C and mean annual rainfall about 1,311-1,172 mm. The mean number of annual rainy days is 55, the mean monthly temperature ranges from 21.3°-30.2°C. The climate is tropical dissymmetric with the bulk of the rainfall during northeast monsoon October-December (Indian Meteorological Department - Chennai).

Data collection

A total of 10 belt transects of about 5 × 100m were laid randomly (wherever the vegetation cover was predominantly found) in 10 different regions at different distance gradients from shoreline till the lagoon boundary begins. Every plant species found along the 10 transects are recorded by observation while walking. Species are identified then and there. Species list is given in Table 1.

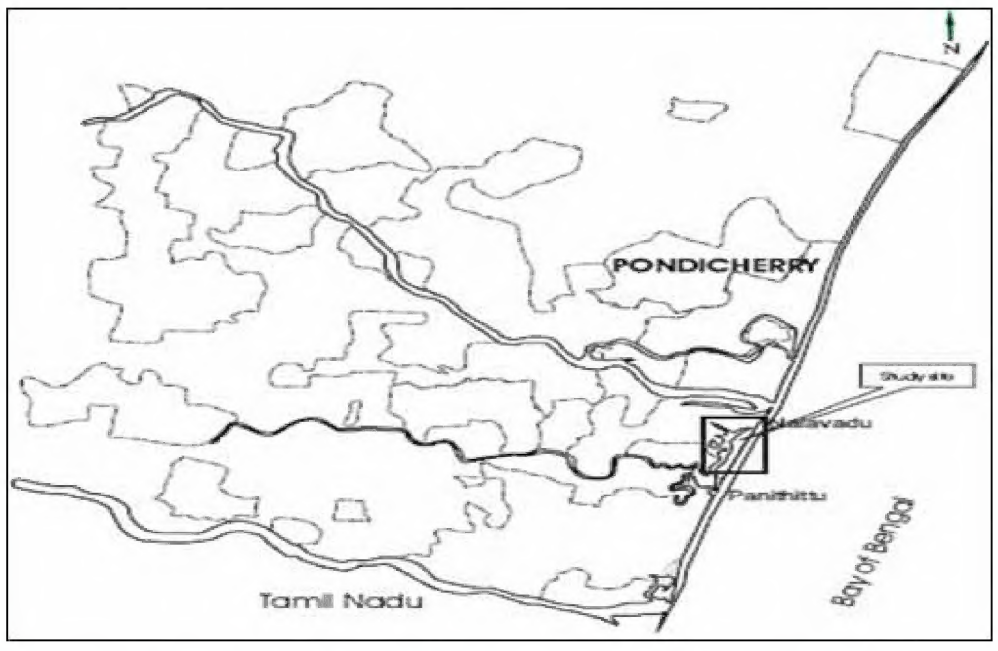

FIGURE 1. Map showing the study site Nallavadu village , Puducherry.

RESULTS AND DISCUSSION

Indian CSDs consist of 154 species belonging to 108 genera and 41families (Arun *et al.* 1999; Rao and Sherieff 2002) while, 41 species belonging to 35 genera and 20 families were identified during this survey. Cyperaceae was the most common and dominant family with 9 species followed by Poaceae (6), Fabaceae (4), Euphorbiaceae (3), and Rubiaceae (3), and Scrophulariaceae (2). Fourteen families were represented only by one single species (Table 2, Figures 2-5). Temperate Coastal Sand Dunes comprise mainly the members of Poaceae, while tropics with Asteraceae, Cyperaceae and Fabaceae and Poaceae (Arun *et al.* 1999; Rao and Sherieff 2002; Sridhar and Bhagya 2007).

As several authors have pointed out in various parts of the world, many dune ecosystems support high plant richness and diversity values (*e.g.* Musila *et al.* 2001; Grootjans *et al.* 2004; Fontana 2005; Celsi and Monserrat 2008). In this sense, the present work also indicates that the study area preserves a rich flora with high number of native dune plants. Moreover, the different vegetation formations together with the dune field geomorphologic heterogeneity provide a wide variety of environmental conditions and habitat types that support a diverse native fauna like Crabs, Dune Lizards etc. The conservation of the native vegetation of the CSD is a priority to conserve the integrity of the natural communities in coastal regions.

FIGURE 2. *Ipomoea pes-caprae* L. R. Br.

FIGURE 3. *Canavalia cathartica* Thouars.

FIGURE 4. *Spinifex littoreus* (Burm. f.) Merr.

FIGURE 5. *Glinus oppositifolius* (L.) A. DC.

Table 1. List of coastal dune flora from Nallavadu Village, Puducherry, India. * Native species; ** Invasive species.

Scientific name	Family
Acalypha indica (Linnaeus, 1753)*	Euphorbiaceae
Aeschynomene aspera (Linnaeus, 1753)*	Fabaceae
Azadirachta indica Adr. Juss.*	Meliaceae
Boerhaevia diffusa (Linnaeus,1753)*	Nyctaginaceae
Bulbostylis barbata (Rottb. and C.B. Clarke 1893)*	Cyperaceae
Canavalia cathartica (Thouars 1823)*	Fabaceae
Canavalia rosea (Sw.and Dc.1825)*	Fabaceae
Casureneia equisitifoliys (Linnaeus, 1753)**	Casureneiaceae
Catharanthus roseus (Linnaeus and G.Don, 1956)	Apocynaceae
Citrullus colocynthes (Linnaeus and Schrader, 1838)*	Cucurbitaceae
Croton bonplandianus (Baillon, 1864)*	Euphorbiaceae
Cyperus arenarius (Retz, 1786)*	Cyperaceae
Cyperus compressu (Linnaeus,1753)*	Cyperaceae
Cyperus rotundus (Linnaeus,1753)*	Cyperaceae
Dactyloctenium aegyptium (L and P. Beauv, 1812)*	Poaceae
Desmodium trifolium (Linnaeus and DC, 1825)*	Fabaceae
Eragrostis viscose (Retz and Trin, 1830)*	Poaceae
Euphorbia rosea (Retz,1830)*	Euphorbiaceae
Fimbristylis cymosa (R.Br, 1818)*	Cyperaceae
Fuirena ciliaris (Linnaeus and Roxb,. 1773)*	Cyperaceae
Gisekia pharnaceoides (Linnaeus,1771)*	Aizoaceae
Glinus oppositifolius (Linnaeus and A. Dc.,1901)*	Molluginaceae
Ipomoea pes-caprae (Linnaeus and R. Br.1818)*	Convolvulaceae
Kyllinga triceps (Rottb. 1773)*	Cyperaceae
Lantana camara (Linnaeus,1753)**	Verbenaceae
Lindernia crustaceae (Linnaeus, 1883)*	Scrophulariaceae
Lindernia oppositifolia (Retz.and Mukerjee, 1884)*	Scrophulariaceae
Ludwigia perennis (Linnaeus,1753)*	Onagraceae
Oldenlandia stricta (Linnaeus,1771)*	Rubiaceae
Oldenlandia umbellata (Linnaeus,1771)*	Rubiaceae
Panicum repens (Linnaeus, 1771)*	Poaceae
Paspalidium flavidum (Retz and A.camus. 1912)*	Poaceae
Pedalium murex (Linnaeus,1759)*	Pedaliaceae
Phoenix sylvestris (Linnaeus and Roxb. 1773)*	Arecaceae
Prosopis juliflora (Sw.and DC.,1825)**	Mimosaceae
Pycreus polystachyos (Rottb and Beauv., 1773)*	Cyperaceae
Pycreus pumilus (Linnaeusand Nees ex C.B. Clarke ,1834)*	Cyperaceae
Spermococe ocymoides (Burm.f, 1768)*	Rubiaceae
Spinifex littoreus (Burm.f. and Merr. 1855)**	Poaceae
Tribulus terrestris (Linnaeus, 1771)*	Zygophyllaceae
Zoysia matrella. (Linnaeus, 1771)*	Poaceae

Table 2. List of families with number of genera and species of coastal dune flora from Nallavadu Village, Puducherry, India.

Family	Genera	Species
Aizoaceae	1	1
Apocynaceae	1	1
Arecaceae	1	1
Casuarinaceae	1	1
Convolvulaceae	1	1
Cucurbitaceae	1	1
Cyperaceae	6	9
Euphorbiaceae	3	3
Fabaceae	3	4
Meliaceae	1	1
Mimosaceae	1	1
Molluginaceae	1	1
Nyctaginaceae	1	1
Onagraceae	1	1
Pedaliaceae	1	1
Poaceae	6	6
Rubiaceae	2	3
Scrophulariaceae	1	2
Verbenaceae	1	1
Zygophyllaceae	1	1

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